What is claimed is:

1. An oil refining system of thermal processes for fine fractions in the field of inertia forces with utilization of vortex separators, vortex vapor generators, and vortex vapor condensers for separation of liquids with different densities and/or different boiling temperatures, which permits obtaining fine uniform oil products by both thermal distillation and cracking at significant simplification of construction elements of said system comprising:

(a) a unit of preliminary oil purification from admixtures, water and satellite gases contained in crude oil; said unit of preliminary oil purification including:

a reservoir, or pipeline with crude oil; a pump for crude oil supply into a vortex separator for separation of oil from water and other admixtures;

a coarse filter for purification from mechanical admixtures;

a heat exchanger for preliminary heating of crude oil with a purpose of reducing viscosity of said crude oil;

a vortex separator for separation of oil from satellite gases, water and dissolved in said crude oil salts;

pumps for oil supply to consecutive units for its separation for fractions and water removal into extraction systems for recovery of useful products; for enhancing of a crude oil purification a separate process can be performed in two vortex separators in series;

(b) a second unit assigned for deep oil separation for fractions consisting of consecutive stages of heating, evaporation of initial oil and residual products of thermal separation including: intermediate furnaces, or heat exchangers for heating of initial product to temperatures corresponding to release of fraction of given composition (close to a boiling point of a particular fraction); vortex vapor generators providing intensive process of evaporation in volume of rotating liquid;

a pump utilized for extraction of evaporation products into condensers and transfer of not evaporated liquid into a consecutive stage of fraction separation; a

vortex vapor condenser for gas products of oil distillation with corresponding cooling system of its construction elements;

a condensation heat can be utilized for preliminary heating of crude oil, or for intermediate stages of oil separation for fractions;

liquid products from vortex vapor condensers of separate stages are supplied by a pump into corresponding reservoirs.

2. An oil refinery system of catalytic cracking processes in said system for heavy products of previous oil distillation for fine fractions comprising:

(a) a tubular furnace for heating of initial product up to temperatures corresponding to heavy fractions boiling in the range of **300-500 C**; and for obtaining of more narrow fractional composition of catalytic products, a furnace for providing a heating of initial product to the temperatures in a sufficiently narrow range distinguished by intensity of heat exchange inside a furnace; and, in this case, a necessity for utilization of several furnaces for successive heating of initial components is eliminated;

(b) a vortex vapor generator with a catalyst layer moving in a boiling layer of a liquid;

(c) a system of a catalyst introduction and extraction into and from a boiling layer of a vortex vapor generator, i.e. a catalyst circulation system;

(d) a catalyst regeneration system, which can consist of already existing equipment;

(e) a vortex vapor condensers of catalyst products and pumps transporting condensate into corresponding reservoirs.

3. A vortex separator utilizing inertia forces of rotating liquid for separation of not purified crude oil from water and other heavy admixtures comprising:

(a) a tangential introduction of crude oil into cylindrical chamber of a vortex separator;

(b) a collector of purified oil;

(c) a chamber for water collection connected with a separator's cylindrical chamber through holes;

(d) a tube for extraction of gases in a backside of vortex separator through a tube, which diameter is less than a gas vortex diameter;

(e) a tangential tube for extraction of purified oil;

(f) a tube for water extraction; and

(g) a separation efficiency of oil from water can be enhanced by repeating of a process in another vortex separator.

4. A vortex vapor generator utilizing inertia forces of rotating liquid for increase of oil vapor intensity output due to increase of up floating bubbles developed in a vortex vapor generator volume in a field of accelerating forces comprising:

(a) a tangential introduction of oil purified from water and preliminary heated in a furnace, or a heat exchanger at elevated pressure exceeding a saturated vapor pressure of oil most light fraction at given temperature;

(b) in a vortex vapor generator volume with increase of a radius a pressure of a liquid falls down, and at preservation of rotating liquid temperature it leads to a situation, when at a certain definite radius the condition of equality of pressure in a liquid and pressure of a dry saturated vapor of a light fraction is realized, and this condition determines a volumetric boiling in liquid with development of microbubbles filled with vapors of light fraction, up floating to a chamber axis under influence of pressure gradient;

(c) a tube for extraction of gases developed in a result of up floating bubbles; and at said tube a subsonic, or critical (sonic) regime of light fractions vapor flow is established; a critical flow regime from the vortex vapor generator provides a way for prevention a propagation of disturbances, or oscillations into the vortex vapor generator during condensation of vapors in a vortex vapor condenser.

(d) by reducing pressure at a vortex vapor generator exit, it is possible to change conditions for boiling in a vortex of the vortex vapor generator, so that pressure in a vortex can be varied; in this case, it is possible to separate fractions with boiling points which are close at pressure **1 atm**, and different at lower pressure.

5. A vortex vapor condenser of oil refinery products utilizing inertia forces of rotating liquid for a condensation of oil's different fractions comprising:

(a) a tangential introduction of a vaporized fraction coming from a vortex vapor generator, where said apparatus external wall is cooled by water or coolant with possible low temperature, where a vapor expansion supplied by a said above vortex vapor generator into a vapor condenser's chamber and removal of coming vapor mass due to condensation on a cooled surface promotes a development of a liquid phase, both on cooled walls, and in a vapor flow (due to throttling effect), where a droplet phase, which is developed in vapor, moves to a chamber's wall under influence of centrifugal forces, where a liquid phase, which is condensed on a wall, is maintained there by said forces, and said liquid phase flows into a condensation chamber's bottom and directed by a pump into a corresponding reservoir for collection of a specific fraction;

(b) a central hole, through which non-condensed vapors of lightest fraction are directed into next stage of condensation of a similar apparatus, or a compressor.

6. A catalytic reactor utilizing inertia forces with catalyst in a boiling layer in a rotating liquid comprising:

(a) a vortex vapor generator chamber with catalyst and supplied liquid (oil heavy residue) where a catalytic reaction takes place;

(b) a collector, through which heavy products of oil thermal cracking and a catalyst are supplied; an alternative way for supply of heavy products and catalyst is through a tangential introduction into a vortex vapor generator chamber;

(c) a swirler, where said products and a catalyst acquire a circumferential speed, and catalysts particles occupy a certain layer in a chamber according to supplied liquid speed, pressure, temperature, and catalysts mass and area;

(d) a vortex vapor generator's chamber with a catalyst, where a swirler location is determined by conditions for development of a boiling layer, i.e. by temperature, pressure and speed of supplied liquid;

(e) a blade constrictor for extraction of a catalyst from vortex catalytic generator for decrease of a vapor and liquid mixture speed and for increase of pressure in an output collector, from where a mixture of oil fractions with solid particles is directed into a catalytic regenerator through an output tube;

(f) a tube for returning a regenerated catalyst from a catalyst regenerator;

(g) a tube through which liquid residuals of catalytic cracking collected in a peripheral area of catalytic reactor are extracted;

(h) a central tube with holes in its walls, through which light fractions of cracking products concentrated in a gas vortex are removed;

(i) a metal grid of an output tube external wall serving for prevention of small size catalyst particles removal with flow of light fractions.

7. A two-zone combustion furnace for reducing energy spending and improvement of ecology of oil refining processes, and permitting improvement of combustion of oil heavy fractions for a combustion completeness with a decrease of solid particles output in outgoing gases comprising:

(a) a first band of burners of light gases developing a first combustion zone with high temperature;

(b) a second band of burners of heavy residue and gases providing additional combustion of unburned gases and solid particles.

8. An oil refinery system for separating crude oil from a mixture of said crude oil and water and dissolved heavy admixtures, and then separating said oil into fractions of different boiling points, said system comprising:

(a) a supply of said mixture of oil, water, and heavy admixtures;

(b) first vortex separator means for separating said oil from said water and said heavy admixtures, wherein said vortex separator means comprises a cylindrical chamber with a tangentially located inlet port for receiving said mixture under pressure;

(c) first collector means for collecting a purified oil which is separated from said water in said vortex separator means;

(d) second collector means for collecting said water after it has been separated from said crude oil in said vortex separator means;

(e) heating means for heating said crude oil to an elevated temperature to reduce the viscosity of said crude oil;

(f) vortex vapor generator means for separating said purified oil into fractions of different boiling points; wherein said vortex vapor generator means comprises a cylindrical chamber including a tangentially located inlet port for receiving said oil under pressure;

(g) first collector means for collecting fractions of said oil having a boiling point below said elevated temperature; and

(h) second collector means for fractions of said oil having a boiling point above said elevated temperature.

9. An oil refinery system for catalytically cracking heavy fractions of oil into light fractions, said system comprising:

(a) heating means for heating said heavy residues of oil to an elevated temperature; said heavy residues are heated at lower heating temperatures with a vaporization taking place in a boiling layer with a catalyst (catalytic reactor); where obtained light fractions are separated, and remained heavier residues heated to higher temperature and sent into a next consecutive reactor, or a chain of reactors;

(b) vortex vapor generator means comprising a cylindrical chamber with a tangentially located inlet port, or a collector with a swirler for receiving said heavy fractions of oil under pressure; wherein said vortex vapor generator means includes a particulate catalyst; and

(c) vortex vapor condenser means for receiving said light fractions from said vortex vapor generator means and condensing said lighter fractions.

10. A vortex vapor generator for separating a vapor from liquid, said vortex vapor generator comprising:

(a) a cylindrical chamber having a tangentially located inlet port for receiving said

liquid under pressure and at an elevated temperature and causing said liquid to rotate circumferentially within said chamber, whereby pressure in said liquid decreases and said vapor forms bubbles which migrate toward the central axis of said chamber;

(b) collector means axially located in said chamber for collecting said vapor.

11. A vortex vapor generator in accordance with claim 10, wherein said collector means comprises an elongated hollow tube with openings to enable said vapor to enter into said tube.

12. A vortex vapor condenser comprising:

(a) a cylindrical chamber including (i) a tangentially located inlet port, and (ii) an outlet port;

(c) a cooling means surrounding said chamber.

13. A method for separating water and heavy liquid admixtures from a mixture of oil, water and heavy liquid admixtures, the method comprising the steps of:

(a) providing a vortex separator comprising a cylindrical chamber having tangentially located inlet port and an outlet port in the wall of said chamber;

(b) introducing said mixture, under pressure, to said chamber through said inlet port;

(c) collecting water at said outlet port.

14. A catalytic vortex vapor generator (reactor) with regulated position of catalyst particles depending on liquid speed, temperature, particles mass, density, speed, and dimensions of catalytic vortex vapor reactor.

15. A catalytic process in a catalytic vortex vapor generator with two different approaches in heating of heavy residue:

(a) a one way for a catalysis in the vortex vapor generator is when an oil heavy residue is heated up to high temperature necessary for heating this heavy residue with utilization of one catalyst; in this case, first products of catalysis are heavy fractions which are condensed in a vortex vapor condenser, all remained uncondensed fractions are directed into a series of vortex vapor condensers;

(b) a second way for a catalysis in the vortex vapor generator is when an oil heavy

residue is heated up to a certain high temperature necessary for a catalysis of a first fraction; then after a catalytic process, these products are directed into a vortex vapor condenser; the remained residue after a first catalysis are directed

after heating to higher temperature than in a previous vortex vapor generator into another vortex vapor generator with another catalyst; and after processing in this vortex vapor generator its products are directed into another vortex vapor condenser; the next vortex vapor generator can utilize another catalyst necessary for processing of remained residue from previous vortex vapor generator with catalysts, etc.